Amendment of the Abstract.

ABSTRACT OF THE DISCLOSURE

~~A method for in situ measurement of strain and temperature of metal and composite tubular's located in the marine environment using optical fiber techniques including Optical Time Domain Reflectrometry (OTDR) or Bragg Diffraction Gratings. The method provides the capability to make axial, circumferential and off axis strain measurements on the body of the riser and in the metal to composite joint region. Through engineering analysis of optical strain measurements, the method provides the capability to determine the bending strain and frequency of Vortex Induced Vibrations (VIV) imposed by ocean currents. Optical fibers of either glass or polymeric composition are located on the outside of metal or composite risers following fabrication and bonded directly to the outer surface of the riser structural body and encapsulated in an outer protective cover. Strain measurements are transmitted to the surface either by a continuous optical fiber light path or by telemetry of a digitized signal.~~

A method is described using optical fiber technology to measure the vibration characteristics of long slender structures subjected to dynamic disturbances imposed by water or wind generated loads. The method is based on making bending strain measurements at selected locations along the length of long slender structures such as marine risers or large ropes using fiber optics technology including Optical Time Domain Reflectometry and Bragg diffraction gratings. Engineering interpretation of information obtained from bending strains determines the vibration characteristics including frequency, amplitude, and wave length. Maximum bending strain measurements assess pending structural damage. One application is measurement of vortex induced vibrations (VIV) response of marine risers. The fiber

optics based method is also applicable to the measurement of the bending characteristics of spoolable pipe using plastic optical fibers which can be interpreted to assess the pipe structural integrity and to prevent lock-up during deployment into a small diameter annulus.